



Data Management for Exchange Servers

Affordable Automation

Network Appliance, Inc.

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Executive Summary

Because of the increasing importance of Microsoft® Exchange in the enterprise, Exchange data management, data protection, disaster recovery, and availability are of increasing concern. A NetApp IP SAN solution replaces existing DAS or legacy Fibre Channel storage to streamline and automate Exchange data management tasks while providing a flexible infrastructure that eliminates downtime, decreases manpower and other costs, and increases data protection.

NetApp primary storage systems combined with NetApp SnapManager® for Exchange enable frequent, nondisruptive, disk-based backups. Exchange can be recovered at any level of granularity, ranging from a single mail item to an entire database in minutes rather than hours or days. NetApp SnapMirror® can be used to mirror critical Exchange data to a remote site for disaster recovery. The combination of NetApp NearStore® secondary disk storage, NetApp SnapLock® software, and leading third-party Exchange archival software can be used to design a complete archival solution that meets strict regulatory requirements for data retention without sacrificing speed of data access.

Table of Contents

1. Consolidating Exchange Storage with IP SANs	3
2. Deploying an IP SAN for Exchange	4
2.1 IP Infrastructure.....	4
2.2 iSCSI Initiators.....	4
2.3 SnapDrive™ and SnapManager for Exchange.....	5
2.3 Storage Considerations.....	5
3. Automating Backup and Streamlining Recovery	5
3.1 Backup.....	5
3.2 Recovery	8
3.3 Single Mailbox Recovery.....	8
3.4 Database Recovery.....	8
4. Ensuring Disaster Recovery	9
5. Regulatory Compliance.....	10
6. Conclusion.....	11

1. Consolidating Exchange Storage with IP SANs

The rapid growth of data stored by Exchange has led to a proliferation of Exchange servers, resulting in high overhead costs, under-utilized server and storage assets, unreliable backup and restore processes, poor system availability, and difficulty with regulatory compliance. Although some Exchange environments have consolidated Exchange storage with SAN technologies, most still rely on direct-attached storage.

A direct-attached storage infrastructure cannot adequately support the requirements of mission-critical Exchange environments. Performance, capacity, data availability, and exponentially increasing management complexity are the main problems. (For an example of the shortcomings of direct-attached storage, see the sidebar, “Arup: Anatomy of a NetApp IP SAN Deployment for Exchange.”)

First-generation FC SAN adopters achieved some benefits from consolidating storage, usually at considerable cost, but—as with DAS—most RAID storage systems deployed with FC SANs lacked the automated data management capabilities necessary to simplify the administration of large and dynamic Exchange environments.

By consolidating Exchange storage with a NetApp IP SAN storage solution, you can significantly streamline Exchange management and reduce overall cost. NetApp users report a substantial reduction in cost of ownership versus FC SAN solutions as a result of reduced infrastructure (hardware and software) costs plus substantial reductions in the manpower necessary to manage Exchange.

Key benefits include:

- Complete consolidation of Exchange storage using familiar IP network technology.
- Improved capacity utilization. (Typical is 70% for NetApp IP SAN vs 30% for DAS.)
- Nondisruptive storage provisioning.
- Existing Windows staff can manage all aspects of the environment because there is no complicated fibre channel infrastructure to support.
- Backups are fully automated and occur in seconds instead of hours, so availability is never affected.
- Any size Exchange database can be recovered in minutes rather than hours or days.
- Remote mirroring can be deployed for disaster recovery.
- Tiered storage options ensure regulatory compliance.

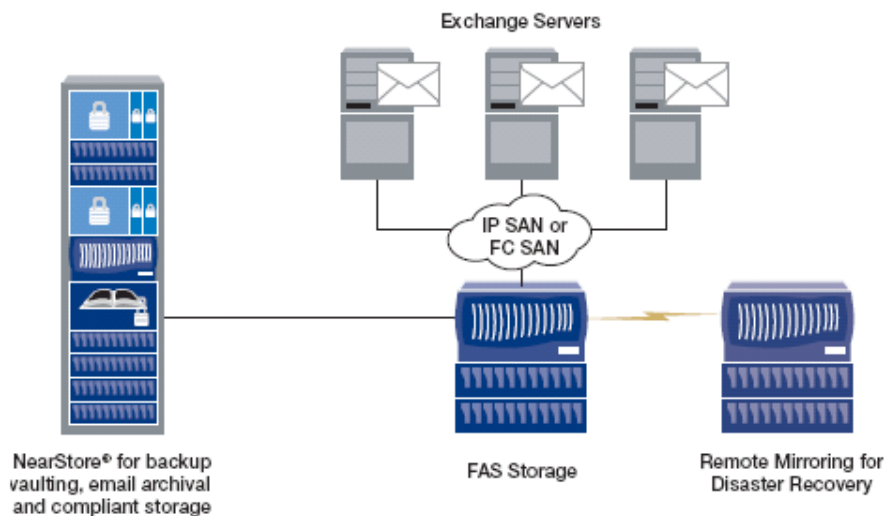


Figure 1) Elements of a complete NetApp IP SAN solution for Exchange.

2. Deploying an IP SAN for Exchange

Configuring an IP SAN for Exchange involves the following steps:

- Configuring the IP infrastructure between Exchange servers and NetApp storage
- Configuring iSCSI initiators on Exchange servers
- Installing NetApp software on Exchange servers
- Configuring NetApp storage

Note: If you are a NetApp customer, you can find the latest information about supported iSCSI initiators, software revisions, etc. by visiting now.netapp.com. NetApp Global Services can provide additional support or assistance when migrating your Exchange environment to NetApp.

2.1 IP Infrastructure

For the most part, configuring the network infrastructure for an IP SAN and Exchange is no different than deploying any other high-performance, network-based application. To ensure optimal performance, a dedicated network infrastructure is recommended between Exchange servers and NetApp storage systems. Some customers use a completely separate Gigabit Ethernet (GBE) network for this purpose, while others use a VLAN in their existing network infrastructure to provide the necessary degree of isolation. If you choose the latter, make sure that all switches and network segments can handle any additional load created by Exchange traffic.

Exchange servers should be configured with one or more GBE interfaces dedicated for storage traffic. Multiple interfaces provide greater storage bandwidth and can be configured for multipath I/O with failover to ensure continuous storage connectivity.

2.2 iSCSI Initiators

Use of the iSCSI protocol requires an iSCSI initiator, which can be based in either hardware or software. Hardware initiators offload TCP/IP and iSCSI processing from host CPUs and are recommended for busy

Exchange servers. However, the majority of customers find that the Microsoft native iSCSI software initiator and standard GBE ports deliver perfectly acceptable performance.

2.3 SnapDrive™ and SnapManager for Exchange

Two NetApp software components run on Exchange servers to enable them to take full advantage of NetApp storage across an IP SAN. Together, these applications make it easy for Exchange administrators to utilize the full capabilities of NetApp storage systems.

SnapDrive Interfaces directly with NetApp storage systems and the Microsoft Windows® Server volume manager to facilitate the management of virtual disks provisioned on NetApp storage.

The software provides storage virtualization of filer volumes via the iSCSI file access protocol. Administrators define virtual disks that are presented to the Windows operating system as logical disks. Once created, the virtual disks can be completely managed by the SnapDrive MMC plug-in and the Microsoft Windows Disk Administrator MMC plug-in.

SnapManager for Microsoft Exchange (SME) enables Microsoft Exchange to leverage the many powerful and specialized features of NetApp storage systems such as backup and restore by using Snapshot™ technology. Additional capabilities include:

- Ability to scale storage capacity and expand volumes without taking either the Exchange server or NetApp storage system offline
- Integration with Microsoft Cluster Server (MSCS) and Multi Path I/O (MPIO)
- Close integration with NetApp SnapMirror for disaster recovery
- Monitoring of disk usage, reserve space usage, and other metrics

Many of these features are discussed in more detail in later sections.

2.3 Storage Considerations

Once the software is installed, you can use NetApp SnapDrive to configure storage volumes for use by Exchange. Here are a few key considerations:

- To ensure optimal performance and recovery capability, Exchange databases and Exchange transaction log files should be placed on separate volumes.
- Separate LUNs should be configured for each storage group.

For a complete discussion of NetApp software and the sizing of disk storage for Exchange, see *NetApp Technical Report 3233: SnapManager for Microsoft Exchange Best Practices*.

3. Automating Backup and Streamlining Recovery

One of the key benefits of combining NetApp storage with Exchange is increased data protection. Typical Exchange sites use tape backups to protect data. With the explosion of rich media and the increasing size of Exchange data stores, tape backups are becoming increasingly time consuming, resulting in long backup windows that affect availability. NetApp overcomes these limitations with disk-based technology for backup and recovery.

3.1 Backup

NetApp SME software provides near-instantaneous online backups of Exchange information stores and includes:

- An easy-to-use interface for scheduling storage-group backups

- Guaranteed backup consistency
- An enhanced backup-set verification feature that verifies backup sets at the application level
- Backup management groups that allow administrators to define and meet backup-set retention policies

SME integrates closely with Microsoft Exchange to ensure backup consistency. Using the NetApp Snapshot technology that is integrated in every NetApp storage system, an entire Exchange server can be backed up in minutes with no impact on availability.

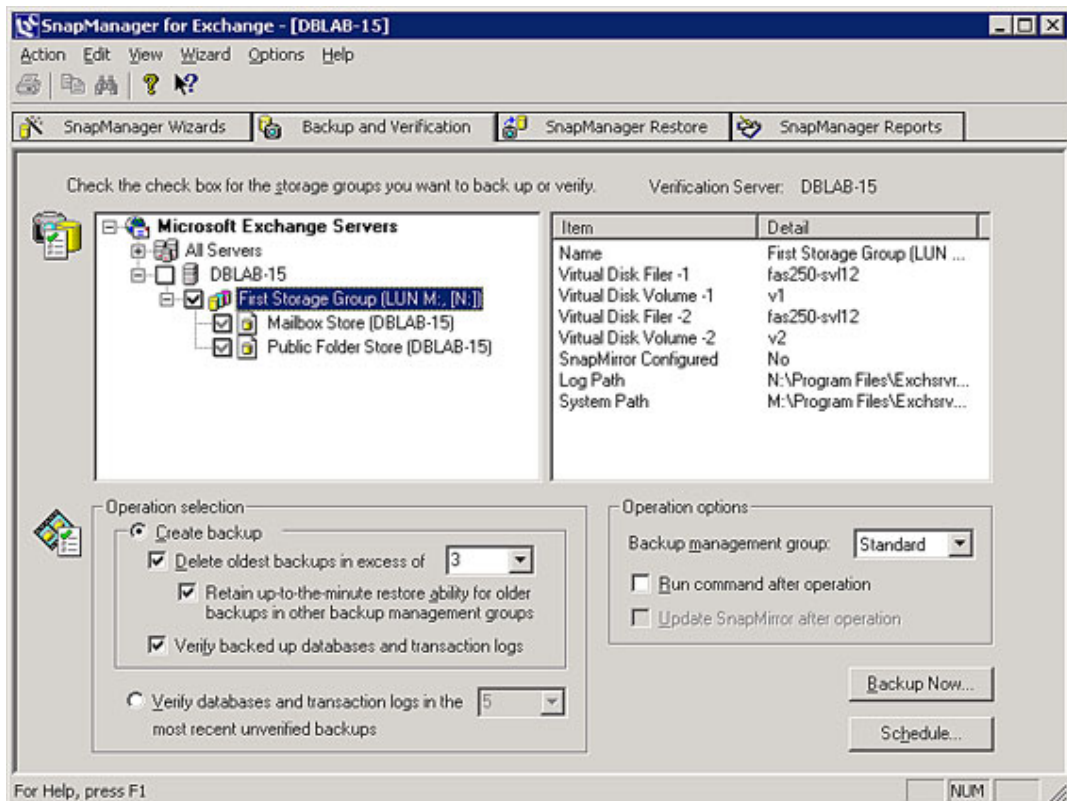


Figure 2) Configuring Exchange backups using NetApp SnapManager for Exchange.

When performing a backup of Microsoft Exchange 2003 on Windows 2003, Exchange uses backup APIs that rely on the Windows Volume Shadow Copy Service to create a shadow copy (or Snapshot copy) of the LUN. The VSS coordinates with Microsoft Exchange, SnapManager for Exchange, and the NetApp VSS hardware provider to prepare for a backup and flush all operations on the disk, allowing a consistent Snapshot backup. Netapp Snapshot copies create a point-in-time view of the Exchange data set. Rather than duplicate the entire data set, Snapshot copies retain the old data as changes occur. For this reason, they are highly space efficient and reside on the same storage volumes as the active Exchange data.

When a backup is initiated, SME requests VSS to create shadow copies from the Exchange application. VSS freezes Exchange and then tells the NetApp VSS hardware provider to create a shadow copy of the Exchange data residing on Network Appliance® storage. Committed Exchange transaction logs are then backed up to the SnapInfo directory for recovery. Once the Snapshot process is complete, VSS thaws the Exchange application, allowing writes to continue in the Exchange databases.

The procedure for Windows 2000 uses native Microsoft Exchange backup APIs (ESE98) to achieve essentially the same result. In either case, the final step of backup is verification. SME conducts a complete, page-by-page integrity check of the storage group data files using the Microsoft ESEUTIL integrity check utility. (ESEFILE is used on older versions of Exchange.) At completion, Exchange administrators are notified that the backup sets are recoverable.

Up to 255 Snapshot copies can be created and kept available for recovery at any point in time. Because the entire backup process is typically measured in minutes, it is common to have it run multiple times throughout the day to enhance protection and availability of Exchange data. SME backups can be stored in backup management groups that are used to determine which backups are targeted for automatic deletion and verification. For archival and disaster recovery purposes, designated backups can be targeted for backup to tape, archiving, or mirroring to a remote site. Disaster recovery and archiving are covered in later sections.

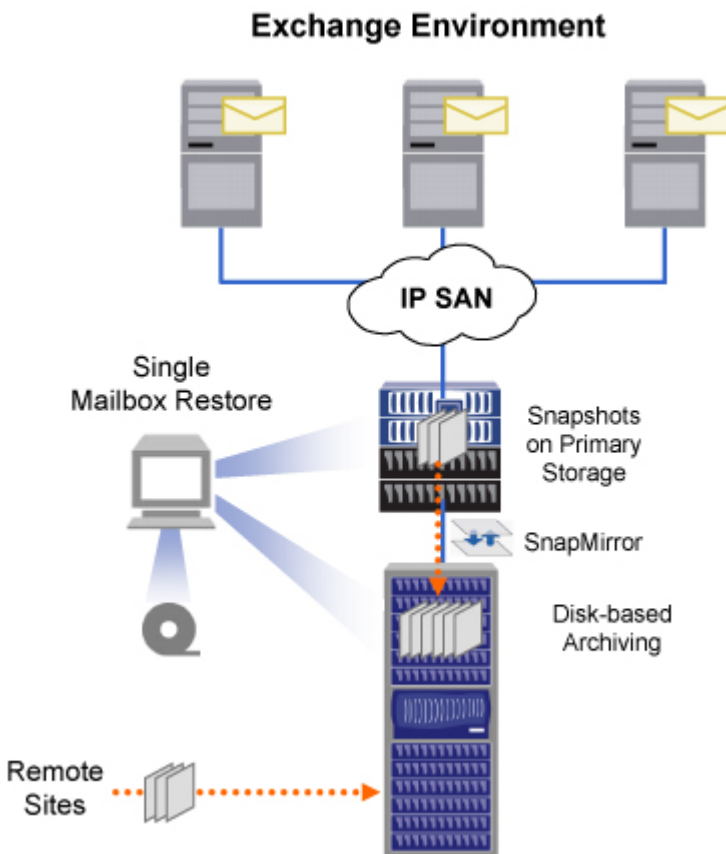


Figure 3) Backup and recovery functionality available for NetApp IP SAN solutions.

Arup: Anatomy of a NetApp IP SAN Deployment for Exchange

Arup is a world-renowned engineering consultancy with 7,000 employees working on projects in 160 countries. Because of the global distribution of Arup personnel, the company depends on Exchange to coordinate activities. Arup considers Exchange its most mission-critical application, supporting more than 7,000 users worldwide with Exchange mail traffic growing at 40% to 50% annually.

Exchange Environment Before the Upgrade

Before moving to NetApp in its London corporate HQ, Arup was using 32 Exchange servers, each with local DAS storage, and experiencing significant problems, including:

- Extremely limited data management capabilities
- Lack of scalability
- Poor availability, with frequent server failures
- Poor performance
- Corruption of backup data
- Excessive downtimes, as often as twice a week (?) every other week (?)
- Inadequate tools that required a lot of IT admin support

3.2 Recovery

NetApp software enables rapid Exchange recovery at any level of granularity:

- Storage group
- Database
- Folder
- Single mailbox
- Single message

SME supports roll-forward recovery using the transaction logs on disk, point-in-time recovery to restore to a specific point in time, or a full-backup recovery using the last full backup. A separate add-on option is available for single mailbox recovery.

3.3 Single Mailbox Recovery

The recovery of single mailboxes or single messages can often be tedious and resource intensive, requiring either the creation of a complex, time-consuming brick-level backup (a backup of the entire Exchange Information Store performed from a MAPI client), or a separate recovery server. NetApp simplifies this process with the Single Mailbox Recovery option. This software directly reads the contents of SnapManager backups without involving the Exchange server, so that individual mail items can be quickly restored from any recent Snapshot copy. Because there is no tape to deal with, archived Snapshot copies can be rapidly searched for previously deleted messages that are no longer in the current mailbox. Individual mailboxes, folders, messages, attachments, calendar notes, contacts, and task items can then be restored directly to a production Exchange server or to a new or existing offline Outlook PST file.

3.4 Database Recovery

As with any database application, the appearance of database corruption or other problems, such as virus infection, that require a full recovery of an Exchange database can be daunting. With traditional tape backups, an administrator would expect to spend many hours locating the correct tapes, restoring the most recent backup of the database, verifying that the restored version is clean, and then replaying hours of intervening transaction logs (also from tape) to bring the database up to date.

With SME, Exchange databases can be rapidly recovered to any point in time up to the minute. SnapManager gives you the ability to try different points of recovery within a single restore operation. Because you typically retain multiple Snapshot copies throughout the day, it's easy to identify the Snapshot copy that occurred closest to the time of failure, minimizing transaction log playback and further speeding recovery. A complete recovery can often be accomplished in a matter of minutes.

Reasons for Choosing IP SAN Technology from NetApp

Arup decided on an IP SAN solution because they needed to consolidate storage with a networked solution but lacked experience with Fibre Channel. The company had a high-speed IP infrastructure between its London data centers and long experience with Ethernet, so when they discovered that an IP SAN could actually increase performance over DAS by up to 30%, the decision was made.

NetApp was chosen to provide storage because of the advanced provisioning, protection, and management capabilities that NetApp technologies provide, including:

- Snapshot and SnapManager for Exchange.
- Rapid backups in offline mode with verification to absolutely eliminate backup corruption.
- Dramatic improvements in availability and resiliency with virtually no downtime necessary.
- Complete solution integration. Achieving similar functionality (on paper) with other vendors would have required five separate applications.

Depending on the nature of the restore requirement, a wide range of restore options can be performed: full Exchange Server content recovery, individual Exchange storage group recovery, individual Exchange database recovery, and virtual disk recovery. Exchange databases can be restored to any server of choice. This helps at the time of recovery and allows testing of the restore procedure before a problem occurs.

4. Ensuring Disaster Recovery

Although the backup and recovery mechanisms described in the previous sections provide protection against user errors, data corruption, virus infection, and other routine problems that can affect data, they do not provide protection against more serious situations such as catastrophic hardware failures or disasters that take down an entire site.

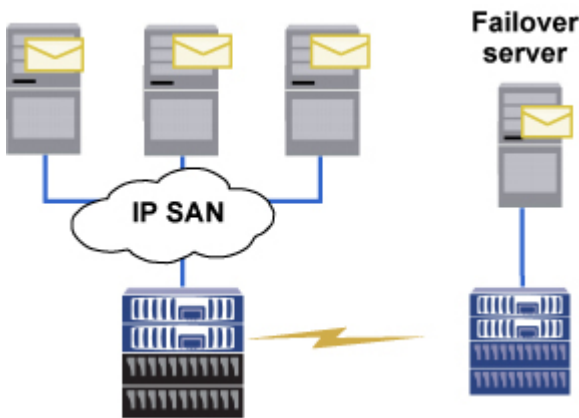


Figure 4) Disaster recovery with SnapMirror.

SME has the ability to recover from tape or other archive media in the event that a production storage system is destroyed in a disaster. However, because the information stored in Microsoft Exchange is increasingly considered mission critical, there is a growing recognition of the need to provide disaster recovery beyond the level provided by offsite tapes. For this reason, SME supports the use of NetApp SnapMirror data-mirroring technology for quick restoration of service.

NetApp SnapMirror software mirrors data to one or more NetApp storage systems over either a local area network (LAN) or a wide area network (WAN). Once source and destination relationships are established, a SnapMirror baseline transfer initializes the mirror to create a replica of the Exchange data on the destination. SnapMirror maintains the synchronization of the replica through incremental updates. As a result, SnapMirror is highly efficient in its use of valuable network bandwidth. To ensure that SnapMirror operation doesn't affect other data traffic on corporate LANs and WANs, the SnapMirror maximum transfer rate can also be adjusted in kilobytes

Solution

The Arup team replaced its original 32 Exchange DAS servers with two higher-performance Exchange servers configured for diskless boot across the IP SAN. At each of two data center sites, an Exchange server supports 1,100 Exchange clients and connects to a NetApp system via iSCSI. In total, 2TB of Exchange data is being stored. Reciprocal mirroring between NetApp systems using NetApp SnapMirror ensures rapid failover in the event of a site outage. VERITAS Enterprise Vault is used in conjunction with NetApp NearStore for archiving.

Ultimately, Arup will expand to five regional Exchange services based on the same technology to meet its worldwide needs.

Results and Benefits

Arup has been very happy with the NetApp solution and the management improvements enabled by SnapManager for Exchange. "Snapshot and Single Mailbox Recovery really complete the Exchange toolkit for us, providing capabilities that Exchange lacks," says Martin Cooper, CTO, Arup Group, Limited. We could have gone a different route, but we would have ended up buying one piece of storage infrastructure and about five different applications to get everything working in the same way as the NetApp solution."

per second. The frequency of SnapMirror update events is determined by the frequency of SME backups.

If a disaster occurs, the SnapMirror copy in the remote location provides an up-to-date replica of all Exchange data. Exchange operations can either be restarted at the remote site or transferred back to the original site when it is restored to operational status.

5. Regulatory Compliance

E-mail archiving is a practical way to decrease the growing cost of Exchange storage while also ensuring compliance with new regulations such as the Sarbanes-Oxley Act. With the continued decrease in disk cost, disk-based e-mail archiving to inexpensive secondary disk storage can replace tape or optical media and ensure rapid access to archived e-mail content. Disk-based archival solutions are now available that preserve e-mail records from further edits or revisions, using write-once, read-many (WORM) technology to comply with regulatory requirements.

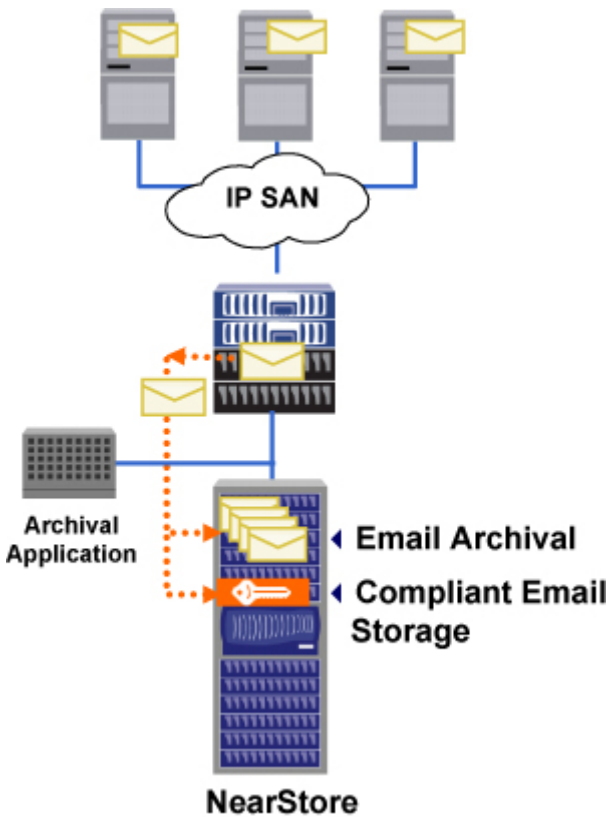


Figure 5) Archiving and compliance.

NetApp archival and compliance solutions offer distinct advantages for Exchange environments. Because all NetApp storage systems are based on the same unified storage architecture, NetApp can offer the benefit of the same operating environment and a single, simple

Since the upgrade, Arup has experienced virtually no Exchange downtime due to storage issues, and manpower costs for Exchange management have gone down substantially. "We went from a team of 12 people taking care of our Exchange infrastructure down to a team of 2," says Cooper.

Key benefits include:

- Elimination of backup data corruption
- No Exchange outages
- Recovery in as little as 5 minutes
- Diskless booting for rapid replacement of an Exchange server with a hot spare on failure.
- Single Mailbox Recovery replaces an hours-long process that required restoring all mailboxes in a storage group before a single mailbox could be extracted
- Major savings in capital, licensing, tape media costs, and hardware refreshes
- Reduction in staff dedicated to Exchange management

Quotes

"We went from a team of 12 people taking care of our Exchange infrastructure down to a team of two2".

"Snapshot and Single Mailbox Recovery complete our Exchange toolkit."

architecture across multiple tiers of storage. Exchange production environments can utilize high-performance NetApp FAS systems using Fibre Channel disks (or ATA drives with unique RAID-DP™) while deploying NetApp NearStore for online archiving using cost-effective SATA disk drives. In either case, the unified storage approach provides the same tool set, and the same data management interface, for all tiers in the infrastructure.

For compliance-driven environments that need the retention capabilities of WORM, NetApp SnapLock provides an appropriate repository for archival applications from NetApp partners such as VERITAS®, Open Text-IXOS, and iLUMIN. The combination of NetApp technology with these applications ensures compliance without sacrificing the ability to rapidly access archived Exchange data

6. Conclusion

A complete NetApp IP SAN solution dramatically simplifies Exchange data management while significantly improving backup and recovery, overall performance, and Exchange availability. The combination of NetApp SnapDrive and SnapManager for Exchange software provides a simple and intuitive management interface for Windows administrators, making it easy to configure and manage Exchange storage and configure fast, consistent, automated backups that improve Exchange availability and data protection.

Easily integrated options provide online disaster recovery, archiving, and compliance capabilities. Automation and ease of use free up valuable administrative resources, allowing them to be more proactive and to focus on value-added tasks. The result is dramatic improvements in Exchange operations in a very affordable solution.

The Arup deployment highlights the benefits of a NetApp IP SAN solution for a busy, distributed Exchange environment. By replacing its direct-attached storage infrastructure with an integrated IP SAN, Arup was able to significantly simplify Exchange data management while dramatically improving backup/restore capabilities and disaster recovery. NetApp can do the same thing for your busy Exchange environment, tailoring a complete solution that meets your exact needs while reducing cost of ownership for your Exchange storage.

“We could have gone a different route, but we would have ended up buying one piece of storage infrastructure and about five different applications to get everything working in the same way.”

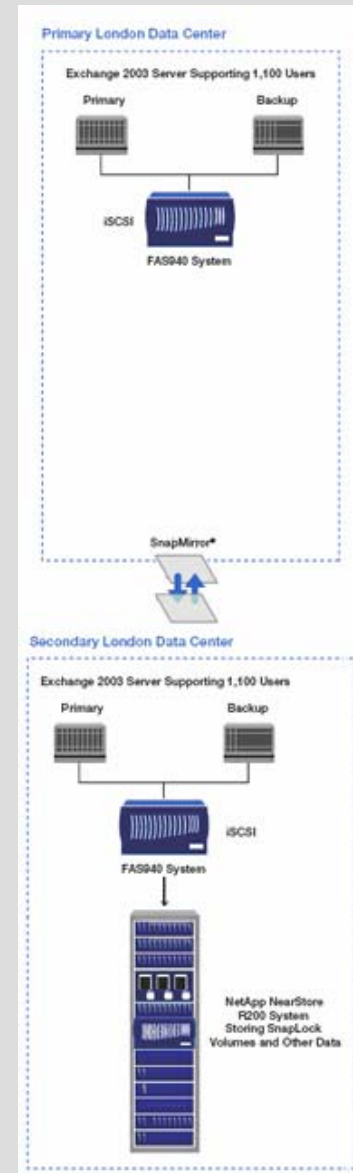


Figure 6) The Arup NetApp IP SAN storage solution for Exchange

